CLAIMS

1. A separator which is interposed between a plurality of electrolyte assemblies each constructed of an electrolyte layer containing an electrolyte medium and a catalytic electrode disposed on a surface in a thickness-wise direction of the electrolyte layer, the separator comprising:

a separating section for achieving separation between a fuel gas channel and an oxidizer gas channel,

the separating section being composed of a flat metal sheet serving as a core member, and a resin layer formed on a surface of the flat metal sheet,

the resin layer being provided with the channel.

2. The separator of claim 1, wherein on a surface of the resin layer is formed a high conductive layer having higher electrical conductivity than electrical conductivity of the resin layer.

3. The separator of claim 2, wherein the high conductive layer is formed at least in a region of the resin layer which is in contact with the electrolyte assembly.

4. A separator which is interposed between a

plurality of electrolyte assemblies each constructed of an electrolyte layer containing an electrolyte medium and a catalytic electrode disposed on a surface in a thickness-wise direction of the electrolyte layer, the separator comprising:

a separating section for achieving separation between a fuel gas channel and an oxidizer gas channel,

the separating section being composed of a flat metal sheet serving as a core member, and a resin layer and a high conductive layer having higher conductivity than conductivity of the resin layer, which are formed on a surface of the flat metal sheet,

the high conductive layer being provided with the channel.

5. The separator of any one of claims 1 to 4, wherein the separator has a sealing section disposed along an outer periphery of the separator, for preventing leakage of fuel gas and oxidizer gas, and

wherein the sealing section is composed of a metal sheet and a rubber layer formed on a surface of the metal sheet, and provided with a sealing projection extending in parallel with a surface of the electrolyte assembly on which a catalytic electrode is formed, the sealing section having a vertex which is constituted so as to be

brought into pressure-contact with the electrolyte assembly under a resilient force.

6. The separator of claim 5, wherein the separating section and the sealing section are integrally formed by a press work.

7. A method for manufacturing a separator which is interposed between a plurality of electrolyte assemblies each constructed of an electrolyte layer containing an electrolyte medium and a catalytic electrode disposed on a surface in a thickness-wise direction of the electrolyte layer, and provided with a separating section for achieving separation between a fuel gas channel and an oxidizer gas channel, the method comprising:

in a region of a surface of flat metal sheet covered with a covering layer, corresponding to a separating section, forming a resin layer provided with the channel by printing of electrically conductive ink.

8. A method for manufacturing a separator which is interposed between a plurality of electrolyte assemblies each constructed of an electrolyte layer containing an electrolyte medium and a catalytic electrode disposed on a surface in a thickness-wise direction of the

electrolyte layer, and provided with a separating section for achieving separation between a fuel gas channel and an oxidizer gas channel, the method comprising:

a base processing step of forming a covering layer on an entire surface of flat metal sheet;

a resin layer printing step of forming a print ink layer provided with the channel in the region of the covering layer, corresponding to the separating section, by printing of the electrically conductive ink; and

a resin layer hardening step of forming a resin layer by hardening the print ink layer.

9. The method of claim 8, wherein at the base processing step, the covering layer is formed on the metal sheet surface via an adhesive layer.

10. The method of claim 9, wherein the adhesive layer is formed of triazinethiol or polyaniline diffused on the metal sheet surface.

11. The method of any one of claims 8 to 10, wherein the covering layer is formed of rubber or synthetic resin having electrical conductivity, and

wherein the electrically conductive ink contains:

a vehicle composed of thermosetting monomer or

thermosetting oligomer for forming the rubber or synthetic resin; and

an electrically conductive filler composed of a metal compound or carbon-base material.

12. The method of any one of claims 8 to 11, wherein at the resin layer printing step, printing is carried out by one printing method selected from a stencil printing, a screen printing, and a gravure printing.

13. The method of any one of claims 8 to 12, wherein at the resin layer hardening step are conducted one of a thermosetting process through heating, a photosetting process through light irradiation, and a combination of the thermosetting process and the photosetting process.

14. A method for manufacturing a separator which is interposed between a plurality of electrolyte assemblies each constructed of an electrolyte layer containing an electrolyte medium and a catalytic electrode disposed on a surface in a thickness-wise direction of the electrolyte layer, and provided with a separating section for achieving separation between a fuel gas channel and an oxidizer gas channel, the method comprising:

in a region of a surface of flat metal sheet,

corresponding to a separating section, molding a resin layer having an electrically conductive green sheet provided with the channel by a stamper.

15. A method for manufacturing a separator which is interposed between a plurality of electrolyte assemblies each constructed of an electrolyte layer containing an electrolyte medium and a catalytic electrode disposed on a surface in a thickness-wise direction of the electrolyte layer, and provided with a separating section for achieving separation between a fuel gas channel and an oxidizer gas channel, the method comprising:

a laminating step of laminating an electrically conductive green sheet on a metal sheet surface;

a molding step of forming a molded layer having the electrically conductive green sheet provided with a channel by a stamper; and

a molded layer hardening step of forming a resin layer by hardening the molded layer.

16. The method of claim 15, wherein the electrically conductive green sheet contains:

a binder composed of thermosetting monomer, thermosetting oligomer, or thermosetting prepolymer for forming the rubber and synthetic resin; and

an electrically conductive filler composed of a metal compound or a carbon-base material.

17. The method of claim 15 or 16, wherein at the laminating step is directly laminated the electrically conductive green sheet on the metal sheet surface by an extrusion molding method.

18. The method of claim 15 or 16, wherein at the laminating step is previously produced an electrically conductive green sheet by an extrusion molding method and then laminated the produced electrically conductive green sheet on the metal sheet surface.

19. The method of any one of claims 15 to 18, further comprising, before the laminating step, a base processing step of treating the metal sheet surface so as to increase adhesiveness thereof with respect to the electrically conductive green sheet.

20. The method of claim 19, wherein at the base processing step, triazinethiol or polyaniline are diffused on the metal sheet surface.

21. A method for manufacturing a separator which is

interposed between a plurality of electrolyte assemblies each constructed of an electrolyte layer containing an electrolyte medium and a catalytic electrode disposed on a surface in a thickness-wise direction of the electrolyte layer, and provided with a separating section for achieving separation between a fuel gas channel and an oxidizer gas channel, the method comprising:

a covering layer forming step of forming on an entire surface of flat metal sheet a covering layer formed of rubber or synthetic resin having electrically conductivity;

a laminating step of laminating an electrically conductive green sheet on a surface of the covering layer;

a molding step of forming a molded layer having the electrically conductive green sheet provided with a channel by a stamper; and

a molded layer hardening step of forming a resin layer by hardening the molded layer.

22. A method for manufacturing a separator which is interposed between a plurality of electrolyte assemblies each constructed of an electrolyte layer containing an electrolyte medium and a catalytic electrode disposed on a surface in a thickness-wise direction of the

electrolyte layer, and provided with a separating section for achieving separation between a fuel gas channel and an oxidizer gas channel, the method comprising:

a coating step of applying electrically conductive slurry to a surface of metal sheet;

a coating layer forming step of forming a coating layer by removing a solvent contained in the applied electrically conductive slurry;

a molding step of forming a molded layer having the coating layer provided with the channel by a stamper; and

a molded layer hardening step of forming a resin layer by hardening the molded layer.

23. The method of claim 22, wherein the electrically conductive slurry is obtained by mixing: a binder composed of thermosetting monomer, thermosetting oligomer, or thermosetting prepolymer for forming the rubber and synthetic resin; an electrically conductive filler composed of a metal compound or a carbon-base material; and a solvent.

24. The method of claim 22 or 23, wherein at the coating step is applied the electrically conductive slurry by a dipping method, a doctor blade method, or

curtain coating method.

25. The method of any one of claims 22 to 24, wherein at the coating layer forming step is dried out the applied electrically conductive slurry by hot air blowing so that the solvent is removed.

26. The method of any one of claims 22 to 25, further comprising, before the coating step, a base processing step of treating the metal sheet surface so as to increase adhesiveness thereof with respect to the coating layer.

27. The method of claim 26, wherein at the base processing step, triazinethiol or polyaniline are diffused on the metal sheet surface.

28. A method for manufacturing a separator which is interposed between a plurality of electrolyte assemblies each constructed of an electrolyte layer containing an electrolyte medium and a catalytic electrode disposed on a surface in a thickness-wise direction of the electrolyte layer, and provided with a separating section for achieving separation between a fuel gas channel and an oxidizer gas channel, the method comprising:

a covering layer forming step of forming on an entire surface of flat metal sheet a covering layer formed of rubber or synthetic resin having electrically conductivity;

a coating step of applying electrically conductive slurry to a surface of the covering layer;

a coating layer forming step of forming a coating layer by removing a solvent contained in the applied electrically conductive slurry;

a molding step of forming a molded layer having the coating layer provided with a channel by a stamper; and

a molded layer hardening step of forming a resin layer by hardening the molded layer.

29. The method of any one of claims 8 to 13, 15 to 21 and 23 to 28, further comprising a high conductive layer forming step of forming on a surface of the resin layer a high conductive layer having higher conductivity than conductivity of the resin layer.

30. The method of claim 29, wherein at the high conductive layer forming step is formed the high conductive layer at least in a region of the resin layer which is in contact with the electrolyte assembly.

31. The method of claim 29 or 30, wherein at the high conductive layer forming step is sprayed a dispersion of carbon particles to form a thin film formed of carbon.

32. The method of any one of claims 7 to 31, wherein the separator has a sealing section disposed along an outer periphery of the separator, for preventing leakage of hydrogen gas and oxygen gas, and

wherein in a region corresponding to the sealing section is formed a sealing projection extending in parallel with an electrolyte layer which is exposed from the electrolyte assembly, the sealing section having a vertex which is constituted so as to be brought into pressure-contact with the electrolyte layer under a resilient force.